

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

**23569**

PATENT TRADEMARK OFFICE

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 Assistant Commissioner for Patents  
 Washington, D.C. 20231

Date: May 24, 2000

Atty. Docket No. SAA-39

Sir:

Transmitted herewith for filing is the original patent application of:

Inventor: Rainer H. Wischinski, 110 North Road, Sandown, NY 03873, USA, has made  
 an invention pertaining to:

For: SYSTEM FOR REMOTE CONFIGURATION MONITORING OF AN INDUSTRIAL  
 CONTROL SYSTEM

Enclosed are:

  X   8 pages specification, 2 pages of claims, 1 page of Abstract and 2 sets of 2  
 sheets of formal drawings (Figures 1-2).

  X   An executed Assignment of the invention to the Schneider Automation Inc.

  X   An executed Declaration combined with Power of Attorney.

## FEE CALCULATION

	Claims Filed / Extra	Rate	Basic Fee 37 CFR 1.16(a) \$ 690.00
Total Claims(37 CFR 1.16(a))	4 - 20 = 0 x	\$18.00	\$ 0.00
Independent Claims	1 - 3 = 0 x	\$78.00	\$ 0.00
TOTAL FILING FEE			\$ 690.00



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SYSTEM FOR REMOTE CONFIGURATION MONITORING  
OF AN INDUSTRIAL CONTROL SYSTEM

BACKGROUND OF THE INVENTION

1. Technical Field

5       The present invention pertains to the field of industrial control automation. More particularly, the present invention pertains to providing technical support over a network for an industrial control system.

2. Description of Related Art

10       Industrial control systems (ICSs) are often provided technical support by vendors of equipment used in the control systems. As new equipment becomes available, including hardware, software or firmware, it would be useful for both the control system user/ owner and the vendor if the vendor were  
15       able to automatically suggest to an end user, from a remote location (the vendor's facility), specific upgrades to the existing equipment, as opposed to for example, simply providing periodically end users with a catalog of the latest available equipment. To do this for only the equipment that the vendor  
20       originally provided would require only that the vendor keep track of the latest equipment the vendor provided to the end user. But it is also desirable for a vendor to be able to suggest to an end user that equipment provided by some other vendor be replaced by the vendor's new equipment.

25       Today, industrial control systems can often be interrogated to determine what equipment is being used. Thus, a vendor can learn what equipment is being used in an ICS even when the equipment was provided by another vendor.

What is needed is a system for interrogating an ICS from a remote location to learn what equipment is being used, and in case of an alternative to a piece equipment being available, to suggest to the owner/ operator of the ICS that the piece of equipment be replaced.

#### SUMMARY OF THE INVENTION

Accordingly, the present invention provides a system for providing technical support for remote automation or control devices, including: a device identifier, for determining components of pre-determined automation or control devices indicated in a device database by periodically querying the devices to have each device indicate its component hardware, software, and firmware, the device identifier for providing the device database with component identifications for the predetermined devices; and a device configuration manager, responsive to the component identifications in the device database, and further responsive to available device components in a database of available device components, for comparing the installed device components with the available device components and for providing an offer to upgrade installed device components.

In a further aspect of the invention, the system also includes: a system diagnostics manager, responsive to the component identifications in the device database, and further responsive to diagnostics information in a database of end user system diagnostics, for providing device status queries, and for updating the database of end user system diagnostics based on responses to the device status queries.

In another, further aspect of the invention, the components of pre-determined automation or control devices are programmable logic controllers.

5 In yet another, further aspect of the invention, the device identifier communicates with the components of pre-determined automation or control devices via a wireless access protocol.

10 In still another, further aspect of the invention, the system also includes a general technical information database, for providing general technical information about products organized by topic, and further wherein the general technical information database maintains a record of requests for information made about a topic, thereby providing feedback on the useability of products.

#### BRIEF DESCRIPTION OF THE DRAWINGS

15 The above and other objects, features and advantages of the invention will become apparent from a consideration of the subsequent detailed description presented in connection with accompanying drawings, in which:

20 Fig. 1 is a context block diagram showing a technical support system for interrogating an ICS and for providing suggestions for upgrading components (pieces of equipment) used by the ICS; and

25 Fig. 2 is a more detailed block diagram of the technical support system module showing its interaction with equipment of the ICS and with the owner/ operator of the ICS (end user).

BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to Fig. 1, to interrogate an industrial control system (ICS) and provide suggestions for upgrading components (pieces of equipment) used by the ICS, a technical support system (TSS) 11 includes a browser for communicating over the Internet via an E-support (indicating support over the Internet) server 14. Either autonomously or at the direction of a technical support provider 17, the TSS 11 at the technical support premises 10 interrogates control or automation devices 22 and 26 of an ICS at ICS premises 20. The control or automation devices 22 and 26 can be connected to the Internet either via a separate server, such as a thin server 23 (any industrialized dedicated support and diagnostic server used to web-enable low-end or legacy devices), or via an embedded web server 21. Communication over the Internet is also shown occurring through a wireless access protocol (WAP) gateway 12 to a wireless (Internet) service provider 13. Correspondingly, at the ICS premises, Internet communications are received via a mobile maintenance station 25, such as a cell phone with an interface to a browser. Having the WAP gateway and the mobile maintenance station 25 allows a service provider on a call to a customer to use a cell phone to call the E-support server 14 through the WAP gateway and obtain information about the customer's system configuration and so to determine what equipment to bring on the call.

Fig. 1 also shows a 3rd party WEB portal 15 having access to a sales database 16. The 3rd party WEB portal is a separate E-server, remote from the technical support premises and connected via the Internet to the E-support server 14 at the technical support premises. The sales database 16 stores sales

information from which information about the configuration of an ICS can be determined.

If the TSS 11 detects equipment being used by the ICS, equipment that the owner/ operator might wish to replace with  
5 alternative equipment, the TSS (again either autonomously or under the direction of a technical support provider 17) sends a message to an end user 27 of the ICS indicating that new equipment is available and asking whether the end user would like to replace or upgrade the equipment currently in use.

10 Referring now to Fig. 2, the TSS 11 is shown in more detail as including a device identifier 35 that interrogates, over the Internet, ICS device 38 attached to the Internet via a web server 37, which may be an embedded server or a standalone server. Based on the information provided in the responses, the  
15 device identifier 35 updates a database (DB) 33 of end user devices and components of devices. In turn, a device configuration manager 36 examines the DB 33 of end use devices and components, comparing them with available equipment stored in a DB 34 of available device components. If the device  
20 configuration manager 36 detects that the owner/ operator might wish to replace or upgrade some equipment, the device configuration manager 36 (either autonomously or under the direction of a technical support provider 17) sends a message to an end user 27 of the ICS via an engineering workstation 24  
25 indicating that new equipment is available and offering to replace the equipment currently in use. If the response by the end user 27 is to accept the offer to upgrade and the equipment to be upgraded is software or programmable firmware, the technical support provider 17 will work with the end user 27 to  
30 put the ICS in a state to accept the upgrade. Usually, for example, the device with the equipment to be upgraded will have

to be put in a safe state before the upgrade is made. The upgrade can then be performed over the Internet, and the device returned to a state of control or automation after the upgrade is completed. In case of upgrading hardware, however, the equipment must first be shipped to the ICS facility. After it arrives, the technical support provider 17 works with the end user 27 to put the ICS in a state to accept the upgrade, and directs the end user in swapping out the equipment.

Besides providing updates or alternatives to ICS equipment in the sense of control or automation devices, the device identifier 35 can also identify (software) tools being used by the ICS to monitor and predict performance of the ICS network, usually a proprietary network, to perform process optimization (for example, to tune the network or to tune an application), to do configuration management (keeping track of changes to the ICS configuration, including changes made to application software), to perform quotations for system upgrades, to perform troubleshooting in case of a malfunction by the ICS, and tools to enable programming for elements of the ICS including either devices or the ICS network.

The remote interrogation capability of the present invention is also useful in performing system diagnostics from the technical support premises, i.e. remotely. System diagnostics includes diagnostics directed to preventive maintenance, machine utilization, machine troubleshooting and other machine diagnostics, process diagnostics, and overall system diagnostics. Thus, system diagnostics are needed for example in troubleshooting, i.e. in case of having to identify an error condition in the ICS, or in detecting when preventive maintenance is needed, including possibly replacing equipment, or in performing process control decisions for the ICS. Still



referring to Fig. 2, the TSS 11 is shown as also including a system diagnostics manager 32 that interrogates the device 38 of the ICS to obtain status information from the device, the information then being used by the system diagnostics manager 32 at the technical support premises, possibly with intervention by the technical support provider 17, in performing system diagnostics for the ICS.

Referring again to Fig. 1, the present invention also provides a general technical information DB 18, hosted by the E-support server 14, accessible to the end user 27, but kept secure against unauthorized attempts at changes to its data. It includes documents providing technical information about products produced by a manufacturer, i.e. brochures, manuals, help, frequently asked questions, problem resolution procedures, technical images (such as photographs and drawings), and associated maintenance documentation, as well as other general technical information. The general technical information database 18 is structured by topic, regularly updated, and allows hyperlinking from web-connected tools, i.e. tools such as a browser. In addition, the general technical information database 18 includes structured interactive training modules to familiarize users with new technology.

The database 18 of general technical information tracks the number of hits for each topic stored in the database, i.e. it tracks the number of customer requests to view each topic. In addition, it tracks which customer makes each request. Such tracking information is used to determine which products are difficult for a customer to use, and which customers in particular are experiencing difficulty using a particular product. Thus, the database 18 of general technical information

provides feedback information on the useability of products,  
feedback that can be used to improve the products.

Through remote interrogation of ICS devices, the present  
invention thus provides an approach to meeting customer needs  
that is individualized to the customer, context-driven and needs  
specific.

It is to be understood that the above-described  
arrangements are only illustrative of the application of the  
principles of the present invention. Numerous modifications and  
alternative arrangements may be devised by those skilled in the  
art without departing from the spirit and scope of the present  
invention, and the appended claims are intended to cover such  
modifications and arrangements.

What is claimed is:

1 1. A system for providing technical support for remote  
2 automation or control devices, comprising:

3 a) a device identifier, for determining components of pre-  
4 determined automation or control devices indicated in a device  
5 database by periodically querying the devices to have each  
6 device indicate its component hardware, software, and firmware,  
7 the device identifier for providing the device database with  
8 component identifications for the predetermined devices; and  
9 b) a device configuration manager, responsive to the component  
10 identifications in the device database, and further responsive  
11 to available device components in a database of available device  
12 components, for comparing the installed device components with  
13 the available device components and for providing an offer to  
14 upgrade installed device components.

1 2. The system of claim 1, further comprising:

2 c) a system diagnostics manager, responsive to the component  
3 identifications in the device database, and further responsive  
4 to diagnostics information in a database of end user system  
5 diagnostics, for providing device status queries, and for  
6 updating the database of end user system diagnostics based on  
7 responses to the device status queries.

1 3. A system as in claim 1, wherein the components of pre-  
2 determined automation or control devices are programmable logic  
3 controllers.

1 4. A system as in claim 1, wherein the device identifier  
2 communicates with the components of pre-determined automation or  
3 control devices via a wireless access protocol.

1 5. A system as in claim 1, further comprising a general  
2 technical information database, for providing general technical  
3 information about products organized by topic, and further  
4 wherein the general technical information database maintains a  
5 record of requests for information made about a topic, thereby  
6 providing feedback on the useability of products.

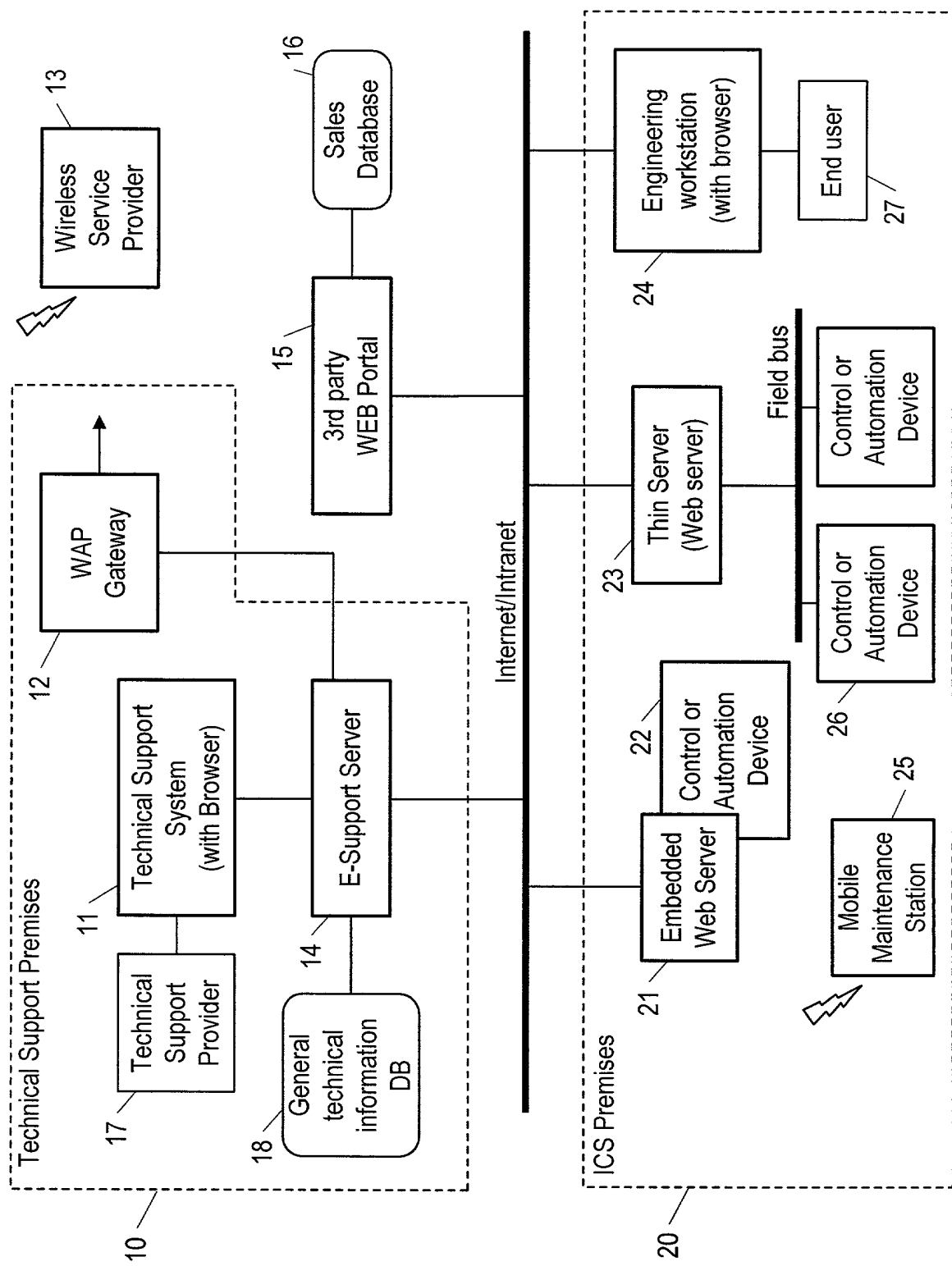
1 6. A system as in claim 5, further wherein the record of  
2 requests for information made about a topic includes an  
3 identification of the requester.

1 7. A system as in claim 1, wherein the device identifier  
2 queries the devices via the Internet.

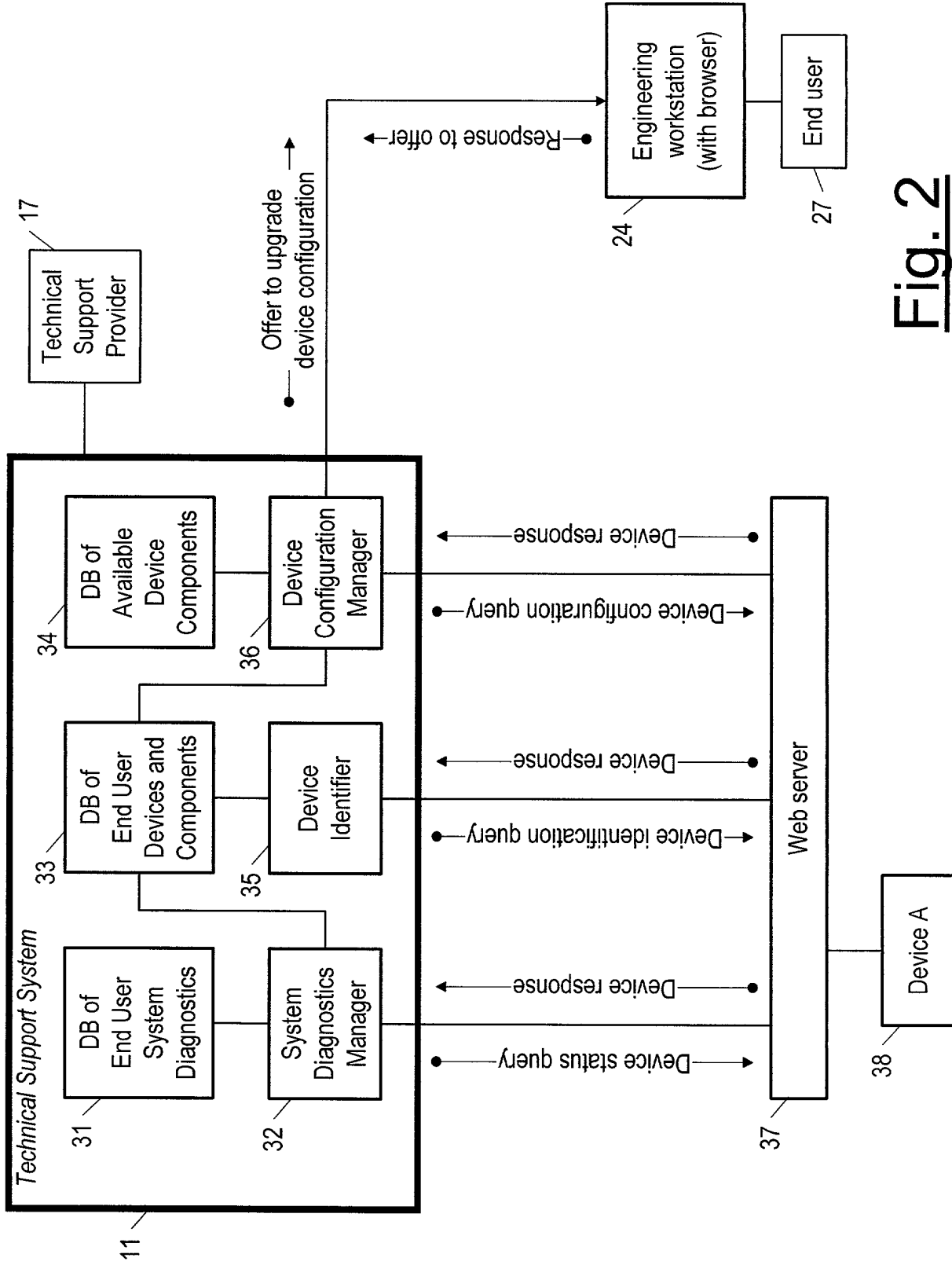
**ABSTRACT OF THE DISCLOSURE**

A system for providing technical support for remote automation or control devices. It includes: a device identifier, for determining components of pre-determined automation or control devices, such as for example programmable logic controllers, indicated in a device database by periodically querying the devices to have each device indicate its component hardware, software, and firmware, the device identifier for providing the device database with component identifications for the predetermined devices; and a device configuration manager, responsive to the component identifications in the device database, and further responsive to available device components in a database of available device components, for comparing the installed device components with the available device components and for providing an offer to upgrade installed device components. In some applications, the system also includes a system diagnostics manager, responsive to the component identifications in the device database, and further responsive to diagnostics information in a database of end user system diagnostics, for providing device status queries, and for updating the database of end user system diagnostics based on responses to the device status queries.

FIG. 1 is a block diagram of a system architecture for a technical support system. The system is divided into two main sections: Technical Support Premises (10) and ICS Premises (20). The Technical Support Premises (10) includes a Technical Support Provider (17) connected to a Technical Support System (with Browser) (11). This system is connected to a WAP Gateway (12), which is also connected to a Wireless Service Provider (13). The Technical Support System (11) is also connected to an E-Support Server (14), which is connected to a General technical information DB (18). The E-Support Server (14) is connected to a 3rd party WEB Portal (15), which is connected to a Sales Database (16). The ICS Premises (20) includes an Embedded Web Server (21) connected to a Control or Automation Device (22). The Embedded Web Server (21) is also connected to a Mobile Maintenance Station (25). The Control or Automation Device (22) is connected to a Field bus, which is connected to two Control or Automation Devices (26). The Field bus is also connected to an Engineering workstation (with browser) (24), which is connected to an End user (27). The system is connected to the Internet/Intranet.



**Fig. 1**



**Fig. 2**

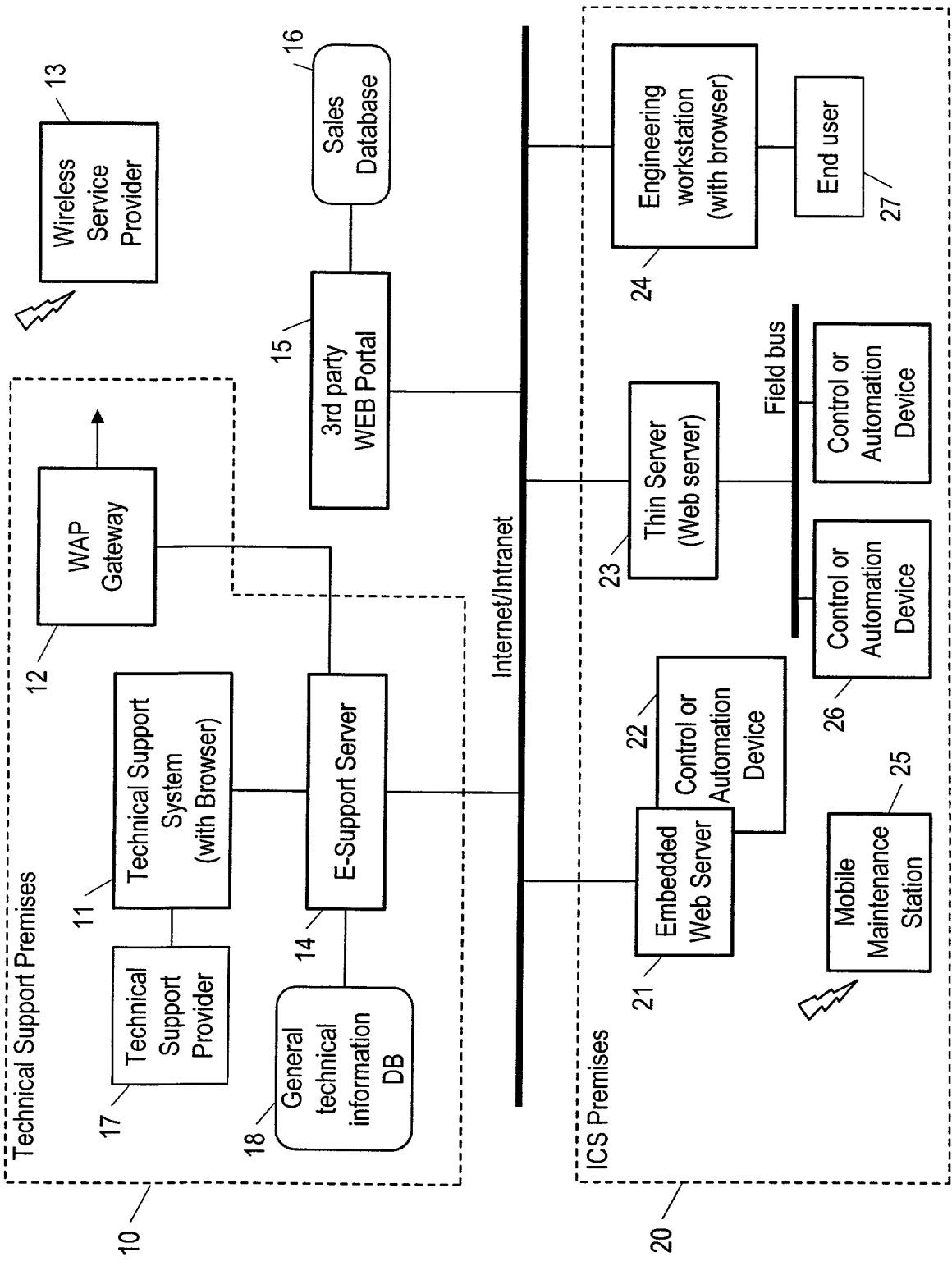
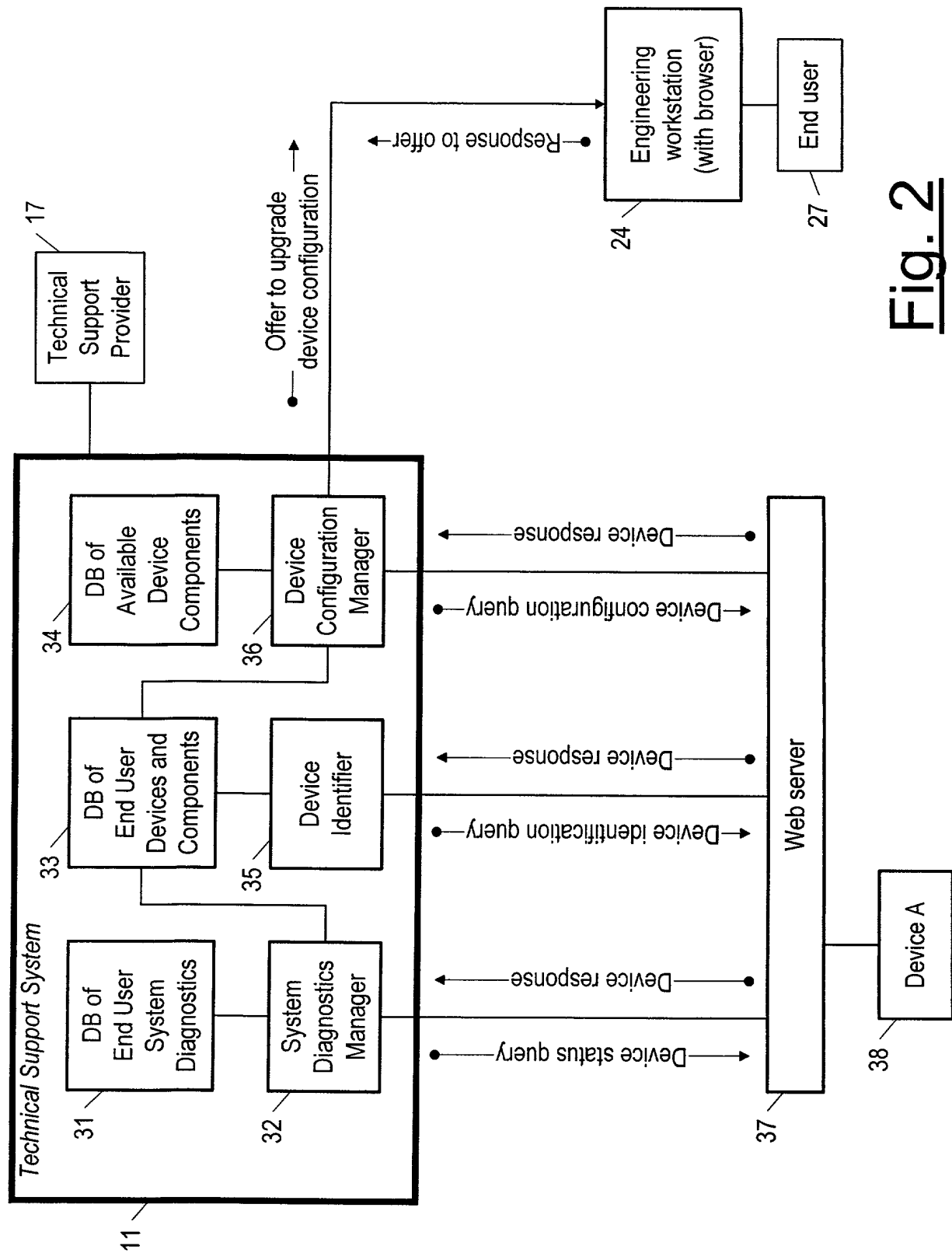


Fig. 1





**Fig. 2**

As a below-named inventor, I hereby declare that:

(1) My residence, post office address and citizenship are as stated below next to my name.

(2) The below-named inventor(s) is/are the original, first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled "System for Remote Configuration Monitoring of an Industrial Control System" Attorney Docket No. SAA-39, the specification of which:

  X   is attached hereto.

           was filed on                      as Application Serial No.                     .

(3) I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

(4) I acknowledge the duty to disclose all information known to me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

(5) I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor certificate listed below and have also identified below any foreign application for patent or inventor certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

Priority  
Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes or No

Priority  
Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes or No

(6) I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a), regarding events which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status)

(Application Serial No.)	(Filing Date)	(Status)

(7) I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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(8) I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are delivered to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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